OIPE JC10
JUN 04 2004
PATENT & TRADEMARK OFFICE

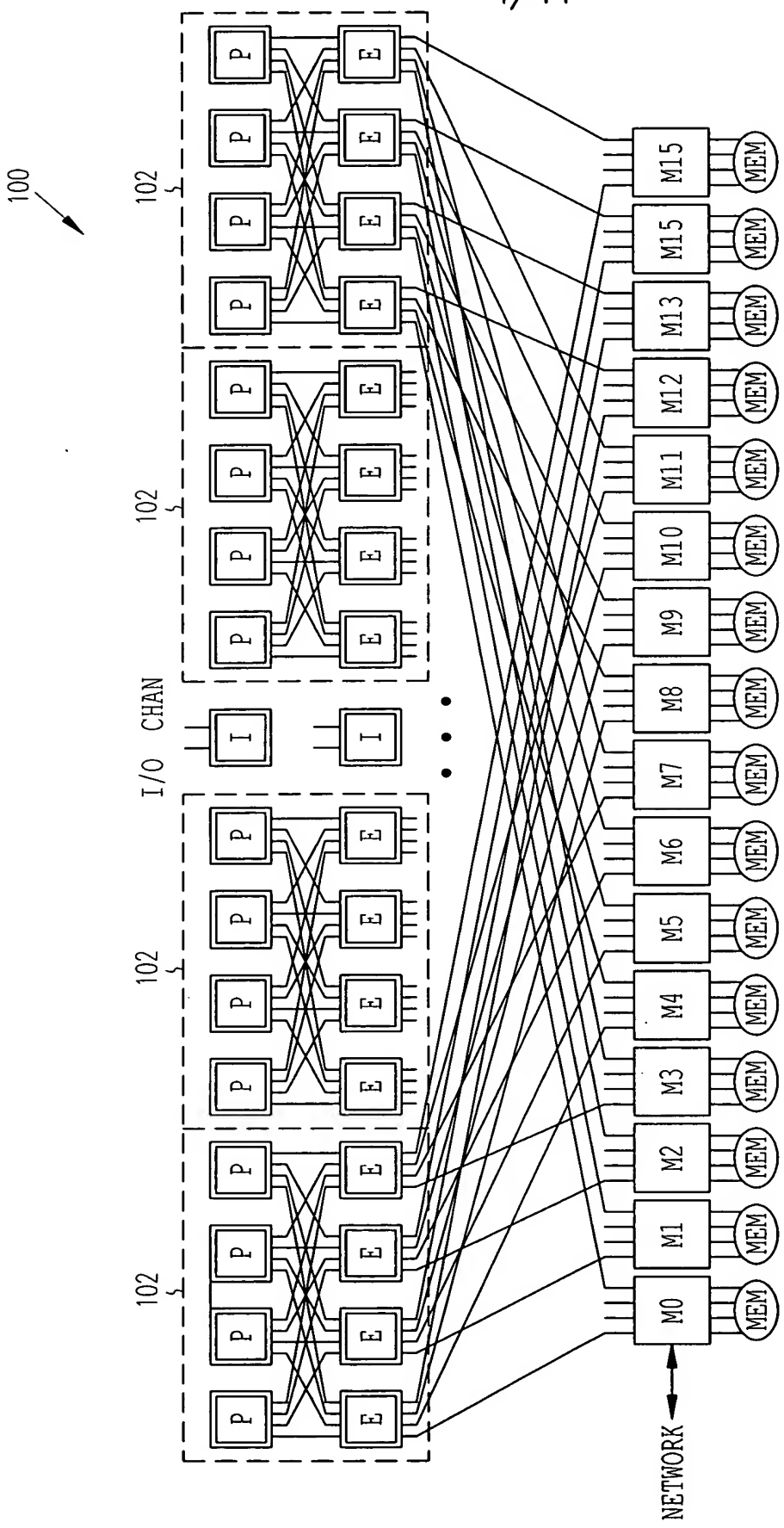

FIG. 1

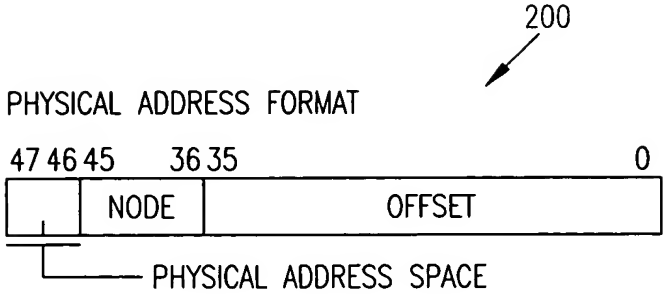

FIG. 2A

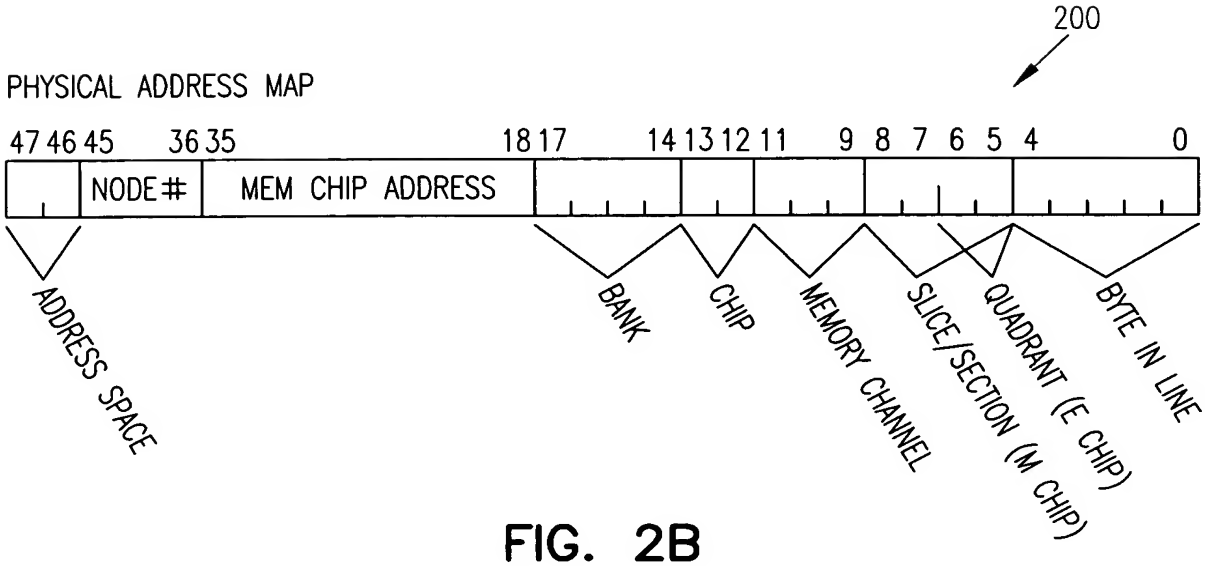

FIG. 2B

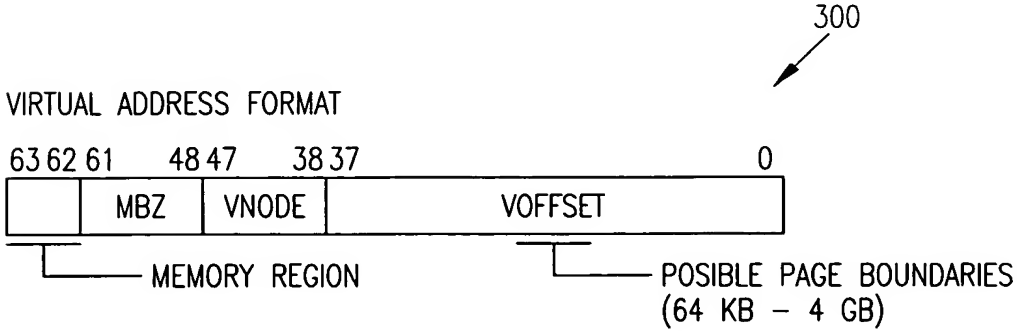

FIG. 3

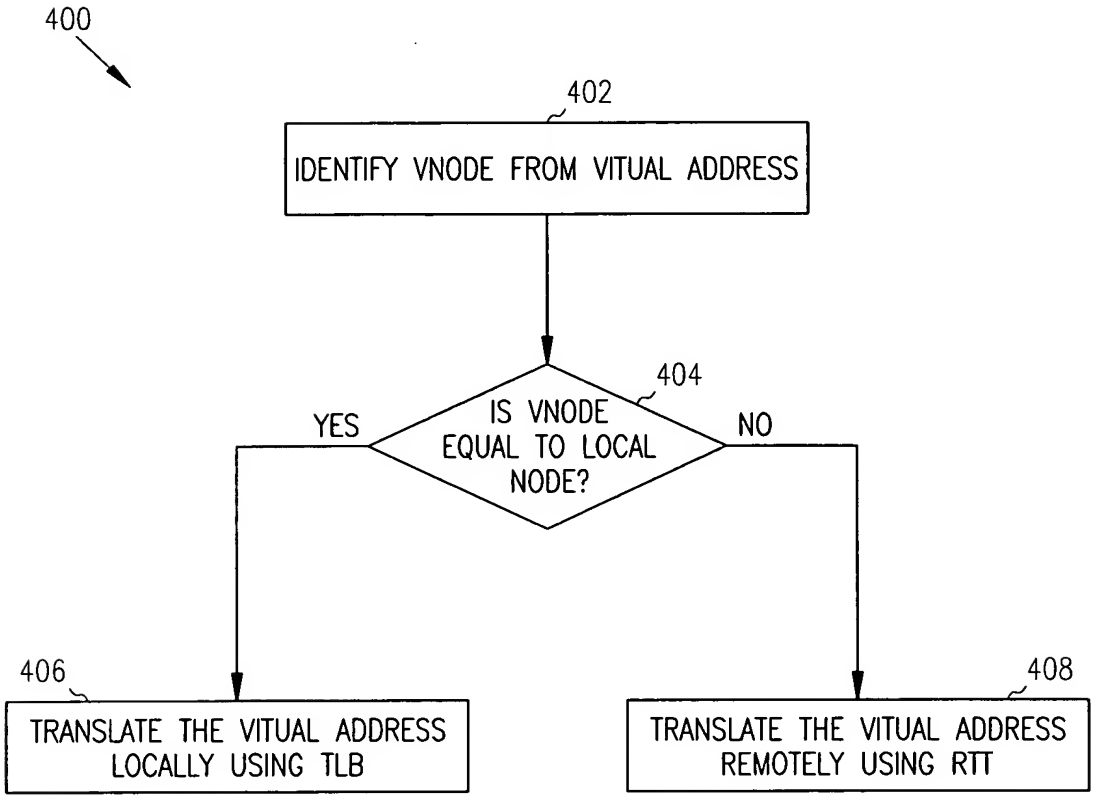
400
402
IDENTIFY VNODE FROM VITUAL ADDRESS
404
IS VNODE EQUAL TO LOCAL NODE?
YES
NO
406
TRANSLATE THE VITUAL ADDRESS LOCALLY USING TLB
408
TRANSLATE THE VITUAL ADDRESS REMOTELY USING RTT

FIG. 4

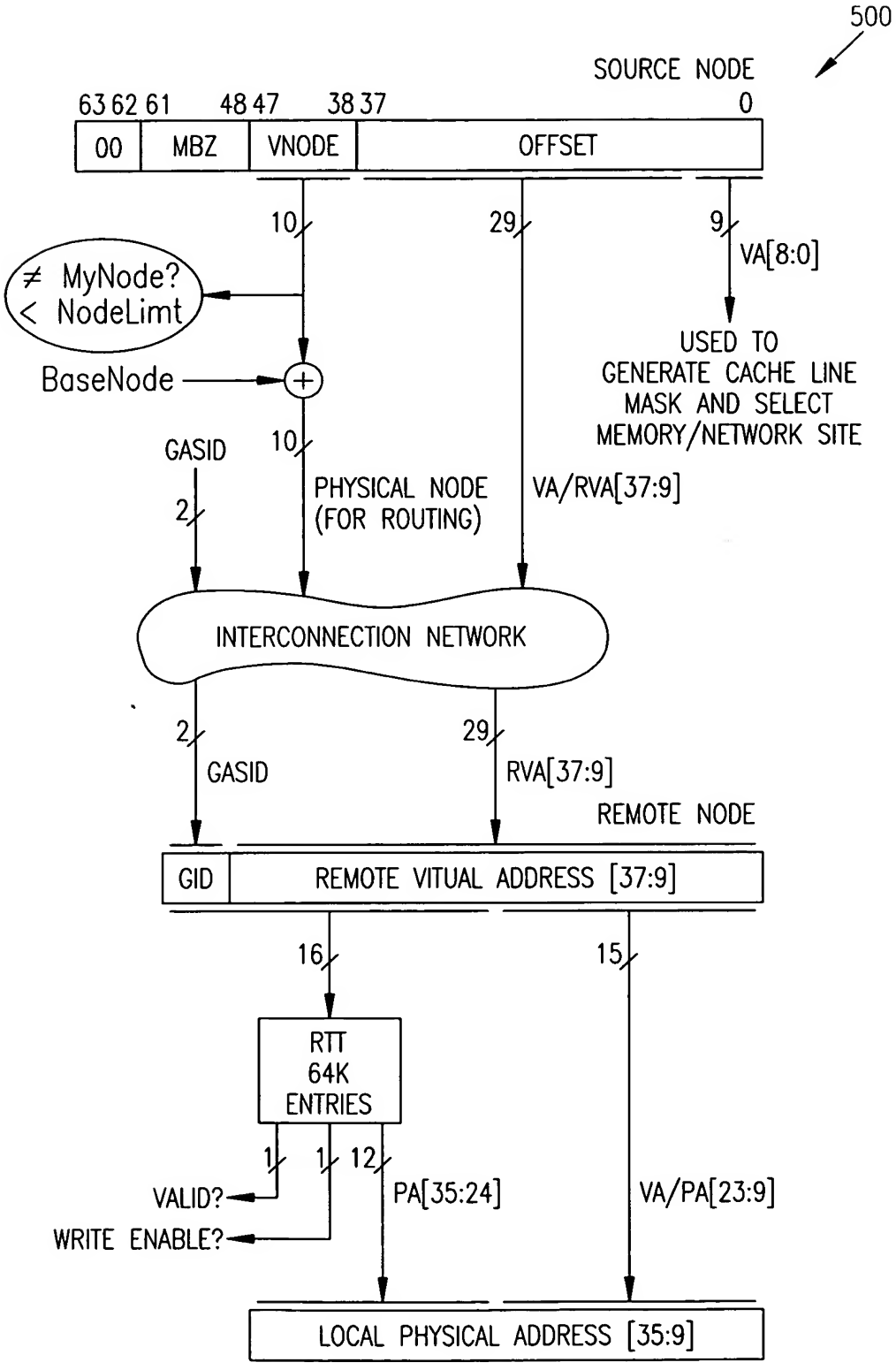
500
SOURCE NODE
63 62 61
48 47
38 37
0
00
MBZ
VNODE
OFFSET
10
29
9
VA[8:0]
≠ MyNode?
< NodeLimt
BaseNode
USED TO
GENERATE CACHE LINE
MASK AND SELECT
MEMORY/NETWORK SITE
GASID
10
2
PHYSICAL NODE
(FOR ROUTING)
VA/RVA[37:9]
INTERCONNECTION NETWORK
2
GASID
29
RVA[37:9]
REMOTE NODE
GID
REMOTE VITUAL ADDRESS [37:9]
16
15
RTT
64K
ENTRIES
1
1
12
VALID?
WRITE ENABLE?
PA[35:24]
VA/PA[23:9]
LOCAL PHYSICAL ADDRESS [35:9]

FIG. 5

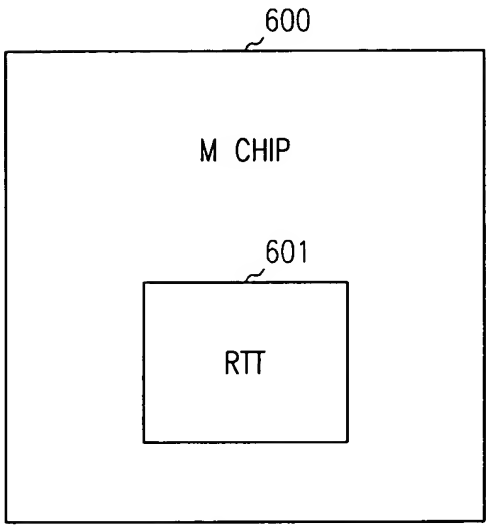

FIG. 6A

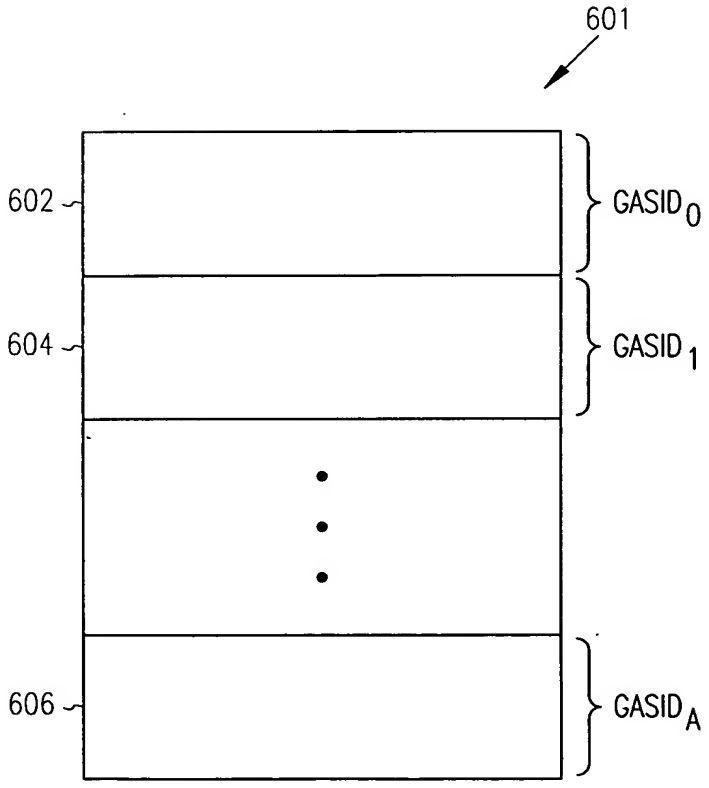

FIG. 6B

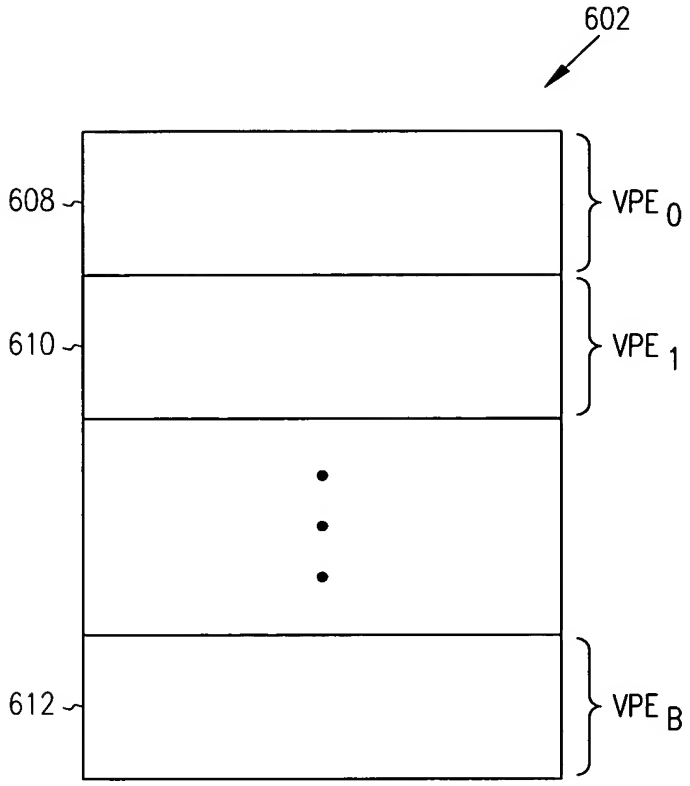

FIG. 6C

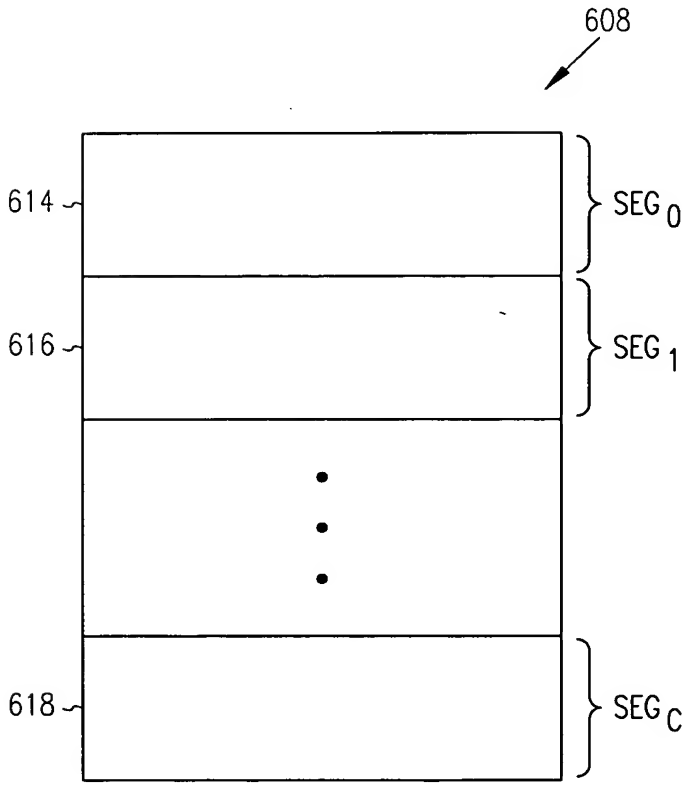

FIG. 6D

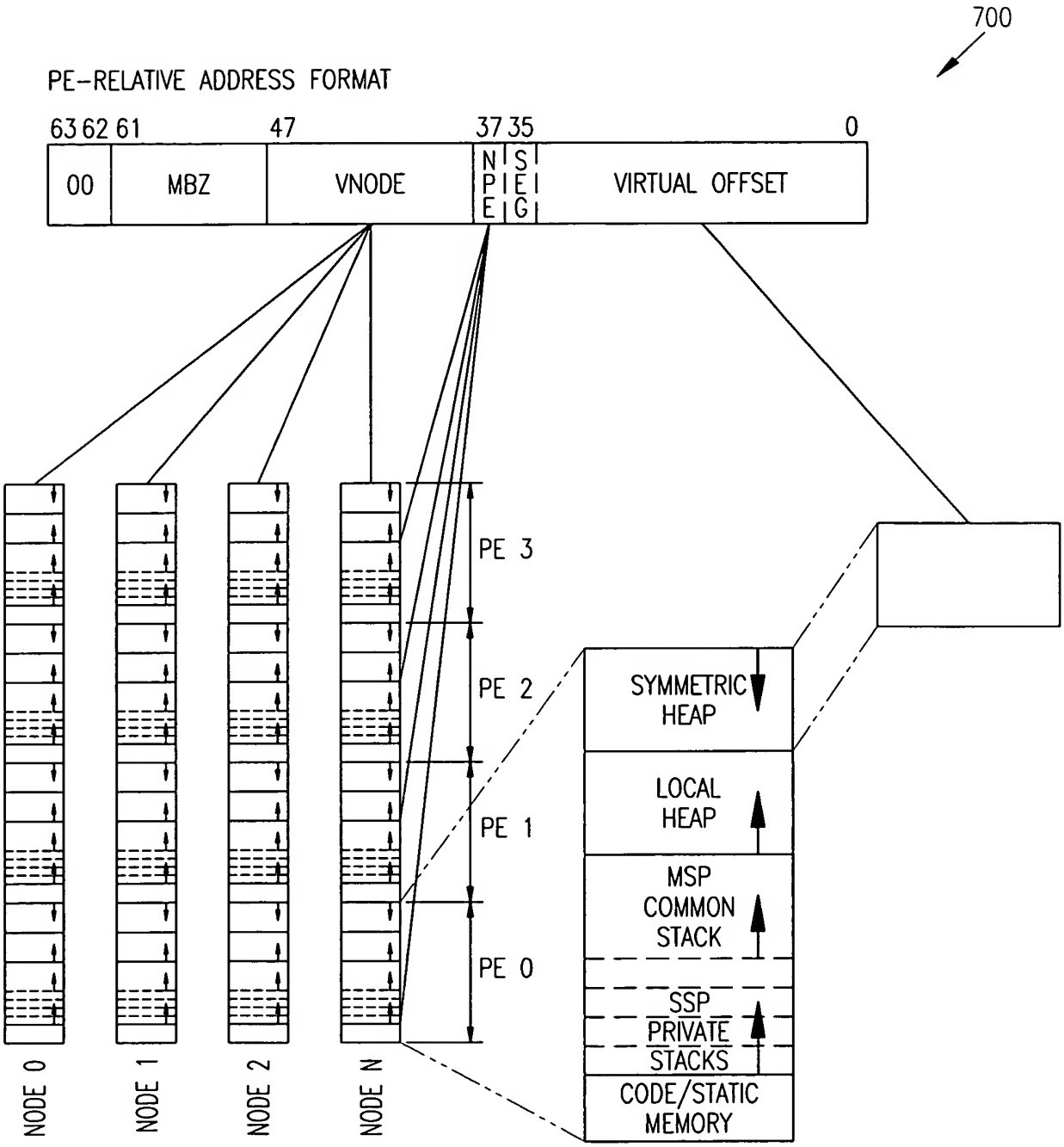
700
PE-RELATIVE ADDRESS FORMAT
63 62 61
47
37 35
0
00
MBZ
VNODE
NPE
SEG
VIRTUAL OFFSET
PE 3
PE 2
PE 1
PE 0
SYMMETRIC HEAP
LOCAL HEAP
MSP COMMON STACK
SSP PRIVATE STACKS
CODE/STATIC MEMORY
NODE 0
NODE 1
NODE 2
NODE N

FIG. 7

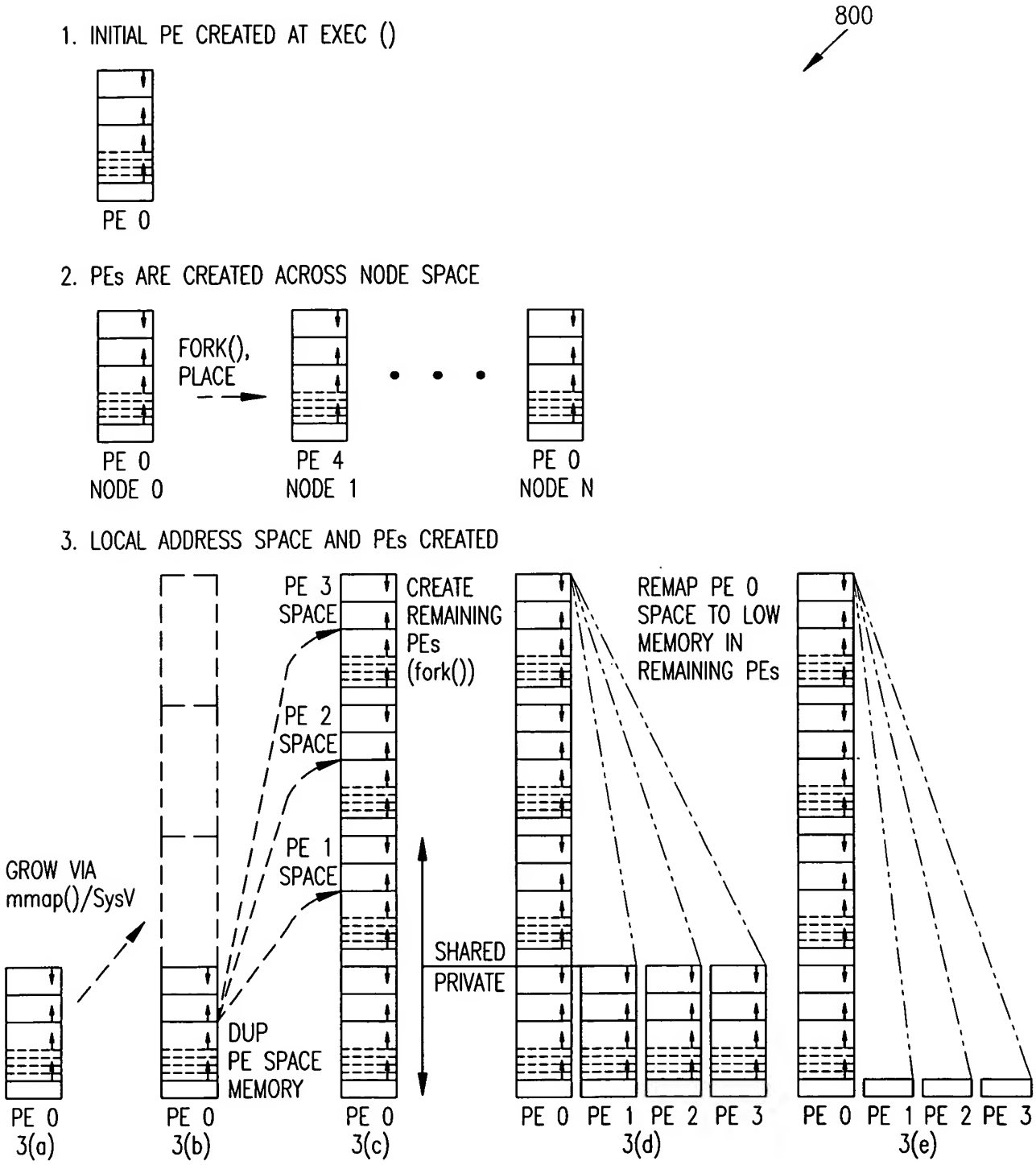
800
1. INITIAL PE CREATED AT EXEC ()
PE 0
2. PEs ARE CREATED ACROSS NODE SPACE
FORK(), PLACE
PE 0 NODE 0
PE 4 NODE 1
PE 0 NODE N
3. LOCAL ADDRESS SPACE AND PEs CREATED
GROW VIA mmap()/SysV
PE 3 SPACE
PE 2 SPACE
PE 1 SPACE
DUP PE SPACE MEMORY
CREATE REMAINING PEs (fork())
SHARED
PRIVATE
REMAP PE 0 SPACE TO LOW MEMORY IN REMAINING PEs
PE 0 3(a)
PE 0 3(b)
PE 0 3(c)
PE 0 PE 1 PE 2 PE 3 3(d)
PE 0 PE 1 PE 2 PE 3 3(e)

FIG. 8

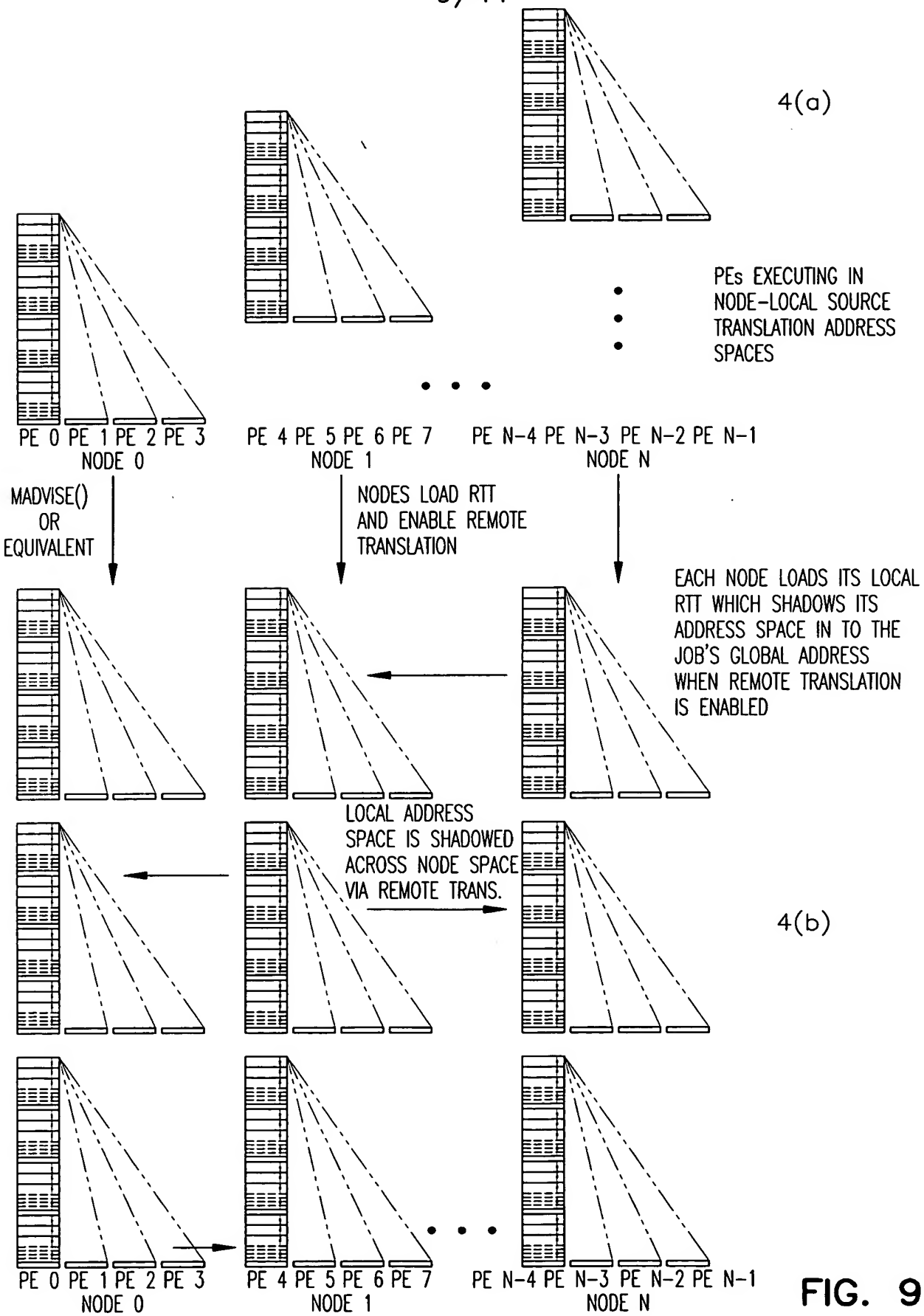
4(a)
PEs EXECUTING IN NODE-LOCAL SOURCE TRANSLATION ADDRESS SPACES
PE 0 PE 1 PE 2 PE 3
NODE 0
PE 4 PE 5 PE 6 PE 7
NODE 1
PE N-4 PE N-3 PE N-2 PE N-1
NODE N
MADVISE() OR EQUIVALENT
NODES LOAD RTT AND ENABLE REMOTE TRANSLATION
EACH NODE LOADS ITS LOCAL RTT WHICH SHADOWS ITS ADDRESS SPACE IN TO THE JOB'S GLOBAL ADDRESS WHEN REMOTE TRANSLATION IS ENABLED
LOCAL ADDRESS SPACE IS SHADOWED ACROSS NODE SPACE VIA REMOTE TRANS.
4(b)
PE 0 PE 1 PE 2 PE 3
NODE 0
PE 4 PE 5 PE 6 PE 7
NODE 1
PE N-4 PE N-3 PE N-2 PE N-1
NODE N

FIG. 9

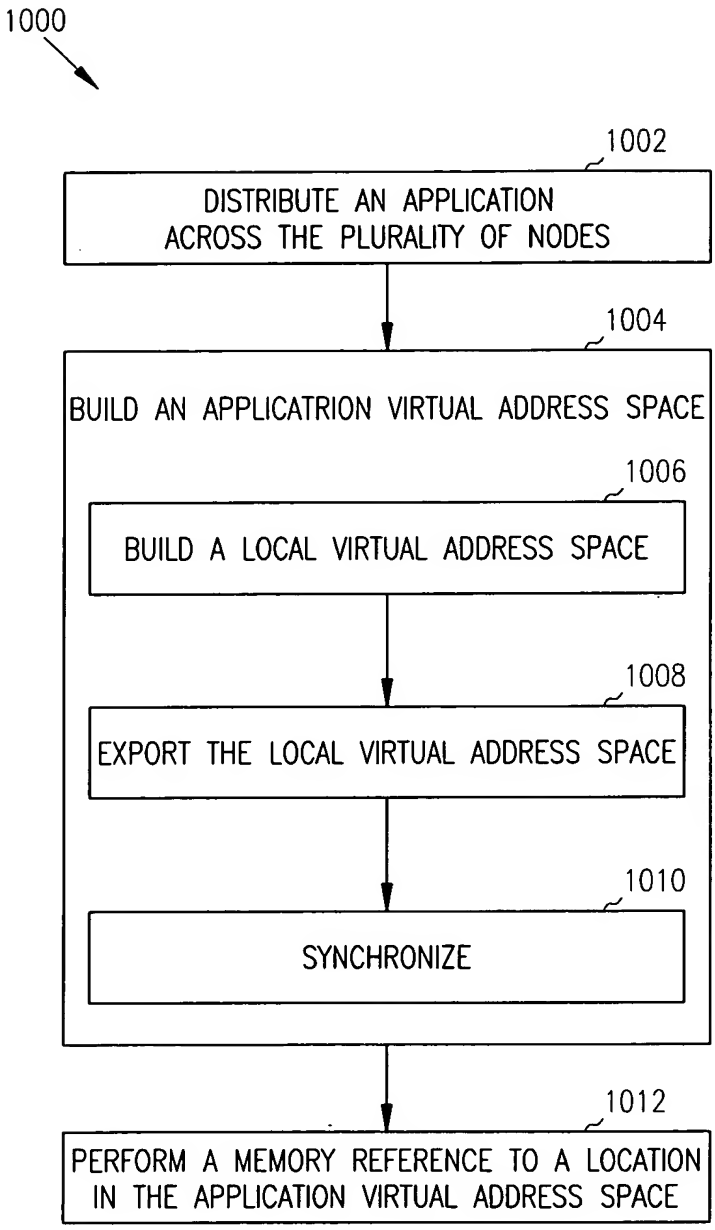
1000
1002
DISTRIBUTE AN APPLICATION ACROSS THE PLURALITY OF NODES
1004
BUILD AN APPLICATRION VIRTUAL ADDRESS SPACE
1006
BUILD A LOCAL VIRTUAL ADDRESS SPACE
1008
EXPORT THE LOCAL VIRTUAL ADDRESS SPACE
1010
SYNCHRONIZE
1012
PERFORM A MEMORY REFERENCE TO A LOCATION IN THE APPLICATION VIRTUAL ADDRESS SPACE

FIG. 10

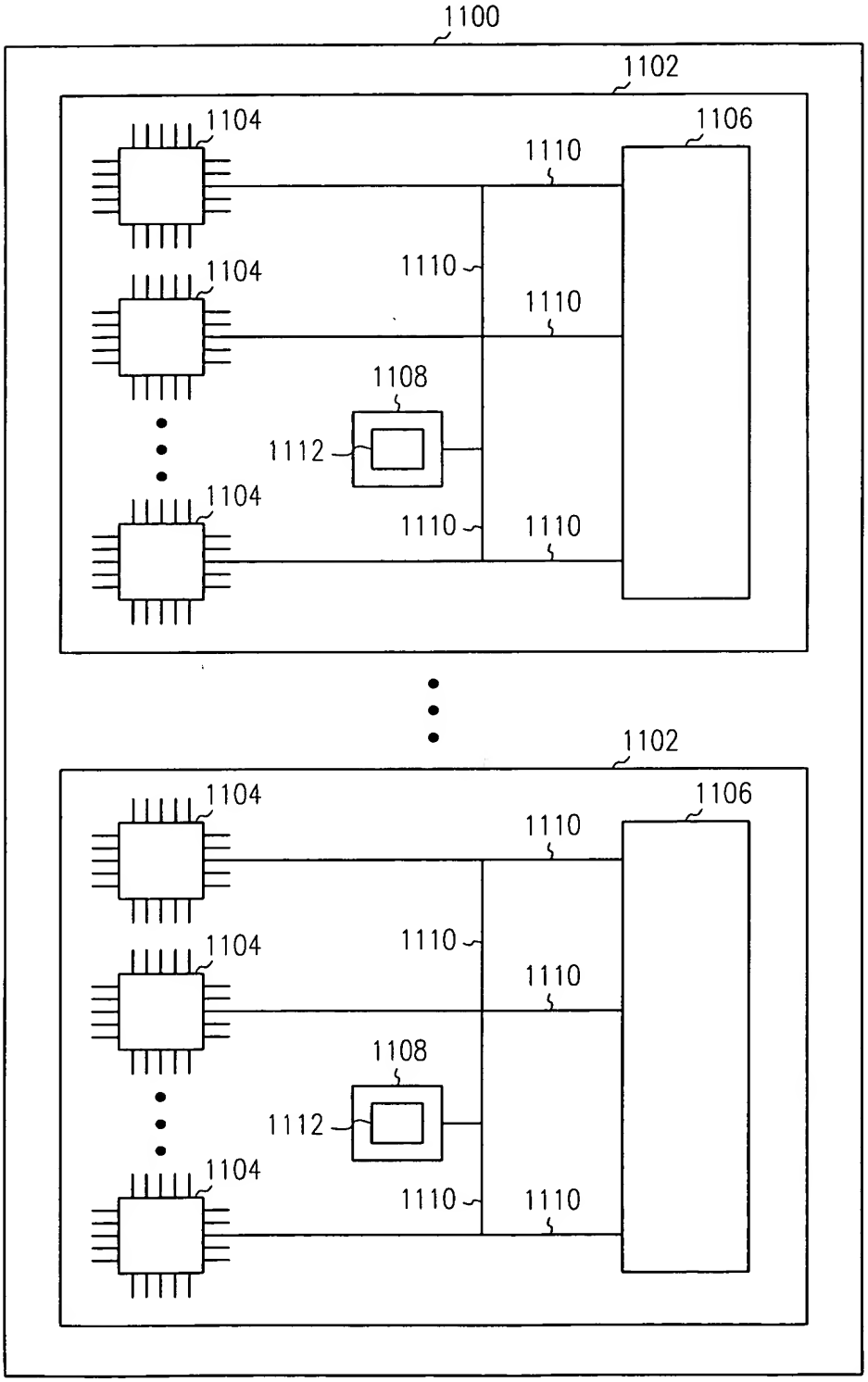
1100
1102
1104
1106
1110
1110
1104
1110
1110
1108
1112
1104
1110
1110
1102
1104
1106
1110
1110
1104
1110
1108
1112
1104
1110
1110

FIG. 11